

## Dielectric characterisation of PA6/ Boehmite alumina nanocomposites. The effect of compounding method.

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**Abstract:** Water-assisted (WA) melt compounding gains an ever growing ground on the field of nanocomposites preparation due to its significant advantages compared to traditional methods. The most important of them are: the reduced health risk during melt mixing of nanoparticles in aqueous slurry compared to dry, volatile powders and the improvement of the dispersion even without surface modification of the filler [1, 2].

In the present study, nanocomposites of PA6 with 3 wt% boehmite alumina (BA) were prepared in two different ways: (i) dry and (ii) water dispersed BA powder was introduced into polyamide 6 (PA6) matrices via direct melt compounding. BA is easily dispersed in water due to the presence of hydroxyl groups on its surface. This, in combination with the hydrophilic character of polyamide chains, is expected to lead in a better dispersion of the nanofiller within the matrix.

Within the current study we investigate the dispersion and the dielectric response of the produced nanocomposites. Broadband dielectric spectroscopy was employed for the electrical characterisation of the samples, over a wide frequency ( $10^{-1}$  Hz to  $10^6$  Hz) and temperature ( $-100^{\circ}\text{C}$  to  $150^{\circ}\text{C}$ ) range. At least four relaxation mechanisms were recorded in the dielectric spectra of PA6 and PA6 based nanocomposites, which are associated with: (i) local motions of  $\text{CH}_2$  segments involving dipolar amide groups ( $\gamma$ -mode of PA6), (ii) to local motion of the polar chain segments involving water molecules hydrogen bonded to free NH groups ( $\beta$ -mode of PA6), and (iii) the glass-rubber transition ( $\alpha$ -mode of PA6) that can be deconvoluted into "wet" and "dry" relaxation modes, and (iv) interfacial polarisation (IP) due to the presence of the filler [3, 4]. The way these relaxation mechanisms are influenced by the presence of BA and the quality of the dispersion, as well as by the preparation technique is presented and analysed.

### References:

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